

# EFB120 - Damper Actuator

On/Off, Spring Return, 100 to 240 VAC



Technical Data	
Power Supply	100...240 VAC, -20% / +10%, 50/60 Hz, 100...125 VDC, ±10%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	21 VA @ 100 VAC, 29 VA @ 240 VAC
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3ft [1m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.57 lb [5.25 kg]

†Rated Impulse Voltage 4kV, Type of action 1.AA, Control Pollution Degree 3.

**Torque min. 270 in-lb, for control of air dampers**

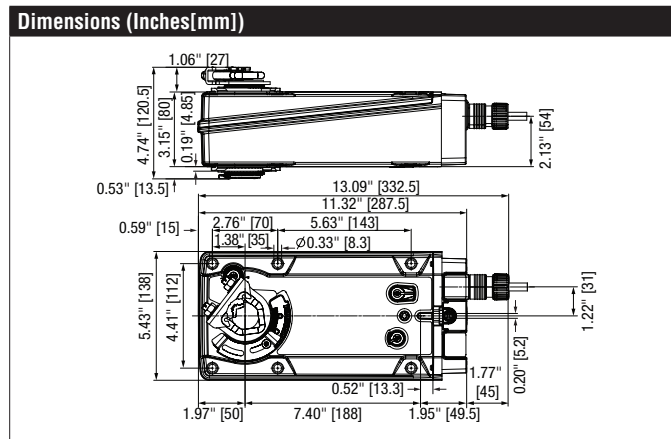
### Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

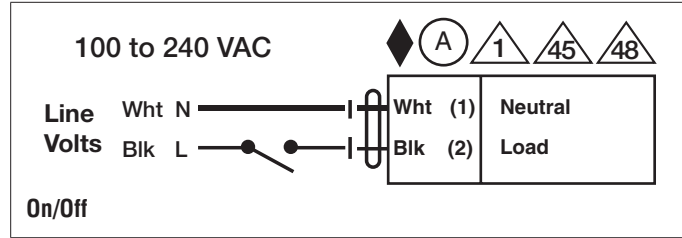
### Operation

The EF.120 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.120 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.120 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.



Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
TF-CC US	Cable conduit connector, 1/2".



### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

- WARNING! LIVE ELECTRICAL COMPONENTS!**  
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
- Meets cULus requirements without the need of an electrical ground connection.
- Actuators with appliance cables are numbered.
- Provide overload protection and disconnect as required.
- Actuators may be powered in parallel. Power consumption must be observed.
- Parallel wiring required for piggy-back applications.

# EFB120-S - Damper Actuator

On/Off, Spring Return, 100 to 240 VAC



## Technical Data

Power Supply	100...240 VAC, -20% / +10%, 50/60 Hz, 100...125 VDC, ±10%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	21 VA @ 100 VAC, 29 VA @ 240 VAC
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	(2) 3ft [1m], 18 GA appliance cables with 1/2" conduit connectors
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.79 lb [5.35 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 10° to 90°

†Rated Impulse Voltage 4kV, Type of Action 1.AA.B, Control Pollution Degree 3.

**Torque min. 270 in-lb, for control of air dampers**

### Application

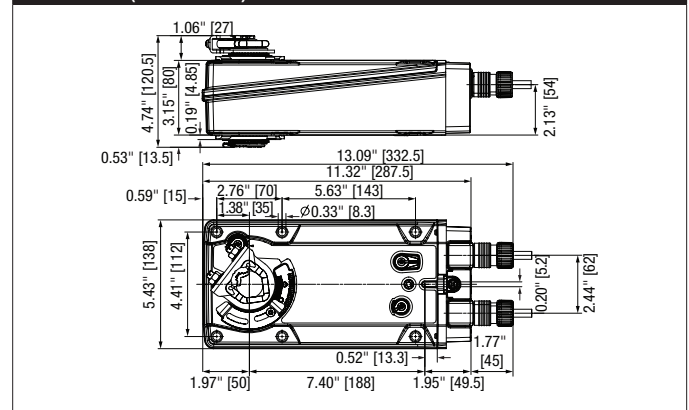
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

### Operation

The EF.120-S series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.120-S series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.120-S versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is adjustable between 10° to +85°. The EF.120-S actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.

### Dimensions (Inches[mm])



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Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
TF-CC US	Cable conduit connector, 1/2".

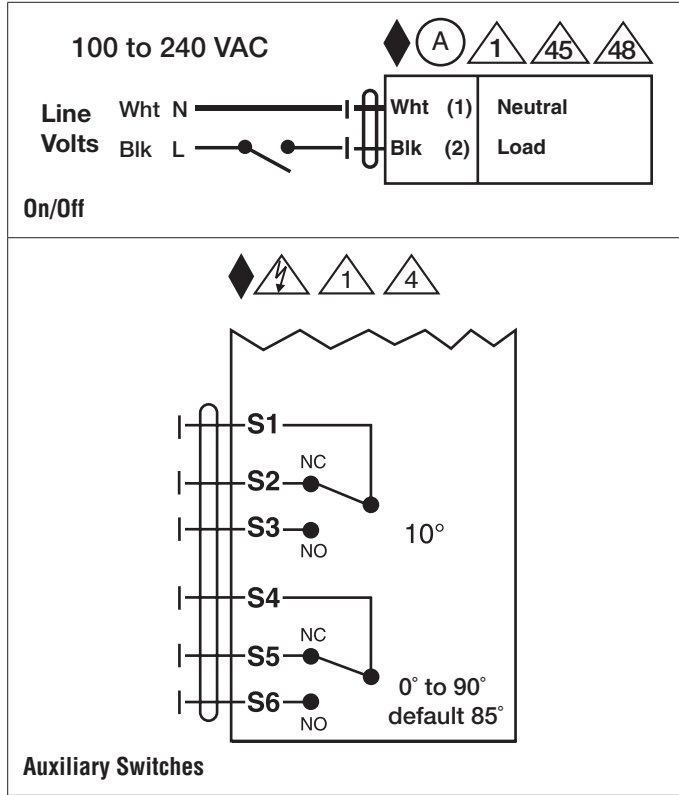
### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

**WARNING! LIVE ELECTRICAL COMPONENTS!**  
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
- Ⓐ Actuators with appliance cables are numbered.
- 1 Provide overload protection and disconnect as required.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 45 Actuators may be powered in parallel. Power consumption must be observed.
- 48 Parallel wiring required for piggy-back applications.



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# EFB120-S N4 - Damper Actuator

## NEMA 4, On/Off, Spring Return, 100 to 240 VAC



### Technical Data

Power Supply	100...240 VAC, -20% / +10%, 50/60 Hz, 100...125 VDC, ±10%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	21 VA @ 100 VAC, 29 VA @ 240 VAC
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.66 lb [5.29 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one set at 85°

†Rated Impulse Voltage 4kV, Type of action 1.A.A.B, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

### Application

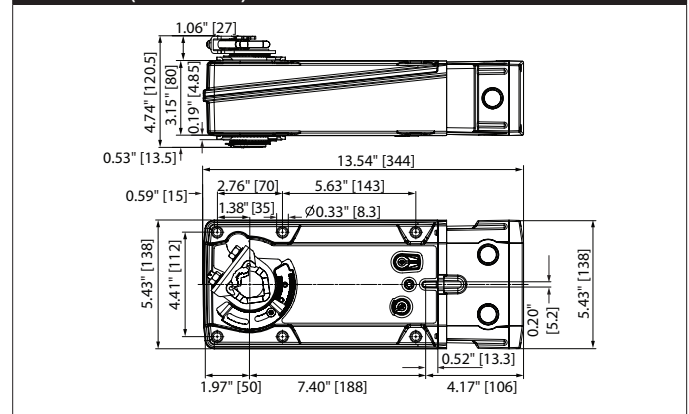
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

### Operation

The EF.120-S N4 series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.120-S N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.120-S N4 versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is fixed at 85°. The EF.120-S N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.

### Dimensions (Inches[mm])



Date created, 02/04/2019 - Subject to change. © Belimo Aircontrols (USA), Inc.

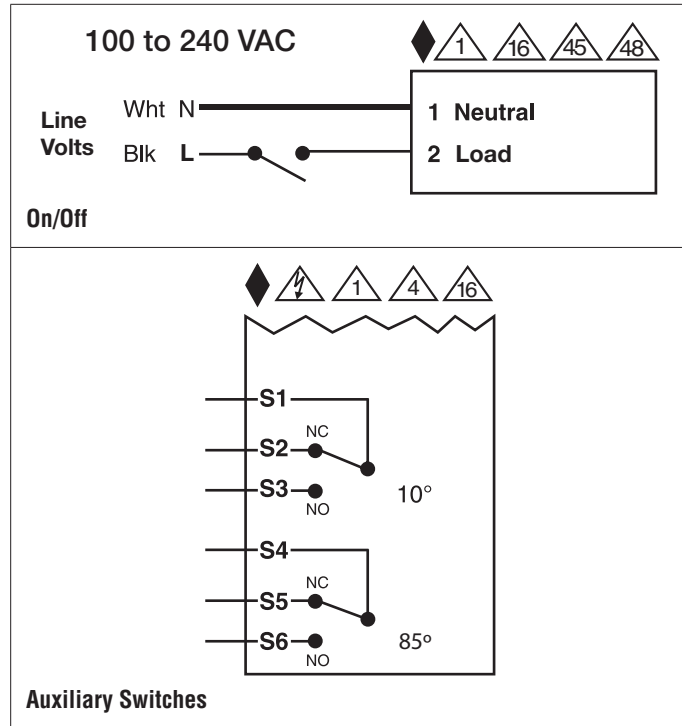
Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.

### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

- ⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
- ◆ Meets cULus requirements without the need of an electrical ground connection.
  - ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
  - 1 Provide overload protection and disconnect as required.
  - 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
  - 16 Actuators are provided with a numbered screw terminal strip instead of a cable.
  - 45 Actuators may be powered in parallel. Power consumption must be observed.
  - 48 Parallel wiring required for piggy-back applications.



# EFB24 - Damper Actuator

On/Off, Spring Return, 24 VAC/DC



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3ft [1m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.38 lb [5.16 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

**Torque min. 270 in-lb, for control of air dampers**

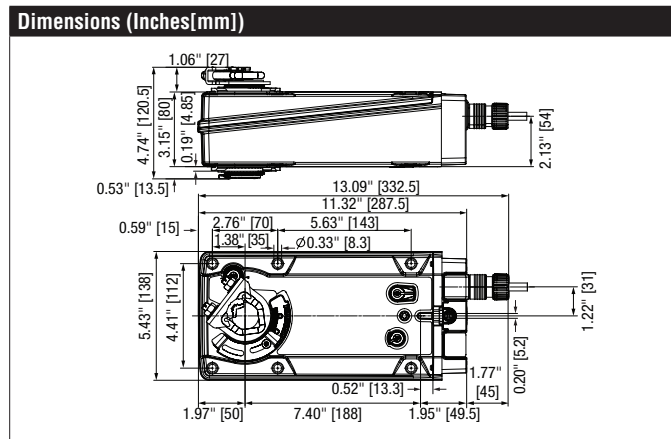
### Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

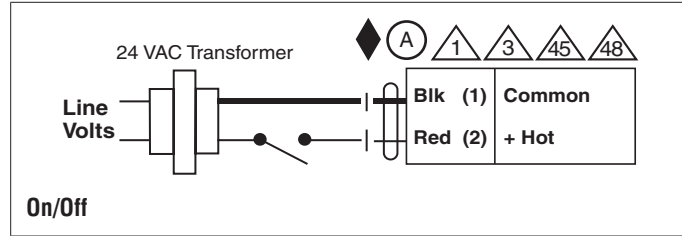
### Operation

The EF..24 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF..24 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.



Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
TF-CC US	Cable conduit connector, 1/2".
ZG-X40	120 to 24 VAC, 40 VA transformer.



### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

**⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

◆ Meets cULus requirements without the need of an electrical ground connection.

Ⓐ Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

45 Actuators may be powered in parallel. Power consumption must be observed.

48 Parallel wiring required for piggy-back applications.



# EFB24 N4 - Damper Actuator

## NEMA 4, On/Off, Spring Return, 24 V



### Technical Data

Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.6 lb [5.26 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

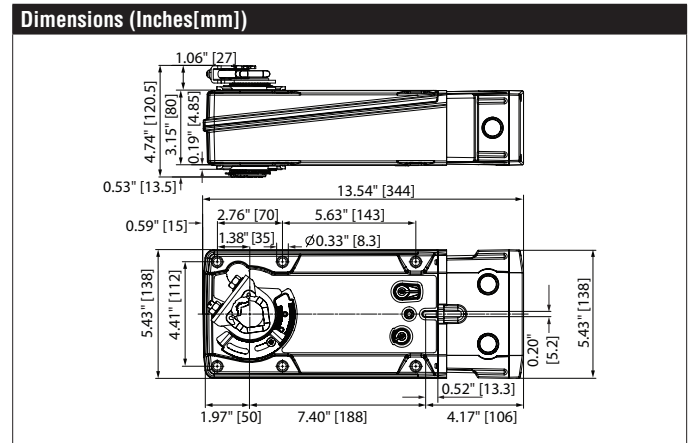
### Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

### Operation

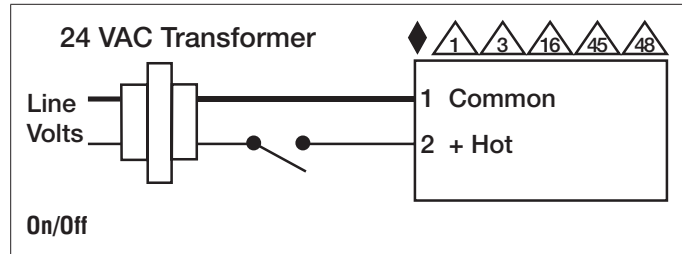
The EF.24 N4 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.24 N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.24 N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.



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Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
ZG-X40	120 to 24 VAC, 40 VA transformer.



### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

- WARNING! LIVE ELECTRICAL COMPONENTS!**  
During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
- Meets cULus requirements without the need of an electrical ground connection.
- Provide overload protection and disconnect as required.
- Actuators may also be powered by 24 VDC.
- Actuators are provided with a numbered screw terminal strip instead of a cable.
- Actuators may be powered in parallel. Power consumption must be observed.
- Parallel wiring required for piggy-back applications.

# EFB24-MFT - Damper Actuator

Modulating, Spring Return, 24 V, Multi-Function Technology®



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3ft [1m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V (default), 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor), variable (VDC, PWM, floating point, on/off)
Operating range Y variable	starting point DC 0.5...30 V end point DC 2.5...32 V
Input Impedance	100 kΩ for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for PWM, floating point and On/Off
Position Feedback	DC 2...10 V, Max. 0.5 mA, VDC variable
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	default 150 sec, variable 60...150 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Angle Of Rotation Adaption	off (default)
override control	min. position = 0% , mid. Position = 50% , max. position = 100% (Default)
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	≤45.3 dB (A) @ 150 sec, run time dependent
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.49 lb [5.21 kg]

\*Variable when configured with MFT options.  
†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

**Torque min. 270 in-lb, for control of air dampers, Control 2 to 10 VDC (Default), Feedback 2 to 10 VDC (Default)**

## Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. A feedback signal is provided for position indication or master-slave applications. Two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft. OR Maximum of three EF's can be piggybacked for torque loads of up to 810 in-lbs. Minimum 1" diameter shaft. Master-Slave wiring for either configuration.

## Default/Configuration

Default parameters for 2 to 10 VDC applications of the EF.-MFT actuator are assigned during manufacturing. If required, custom versions of the actuator can be ordered. The parameters are variable and can be changed by three means: Factory pre-set or custom configuration, set by the customer using PC-Tool software or the handheld ZTH US.

## Operation

The EF..24-MFT actuator provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper mechanical stop and use this point for its zero position during normal control operations. A unique manual override allows the setting of any actuator position within its 95° of rotation with no power applied. This mechanism can be released physically by the use of a crank supplied with the actuator. When power is applied the manual override is released and the actuator drives toward the fail-safe position. The actuator uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls the brushless DC motor's rotation and provides a Digital Rotation Sensing (DRS) function to prevent damage to the actuator in a stall condition. The position feedback signal is generated without the need for mechanical feedback potentiometers using DRS. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-MFT is mounted directly to control shafts up to 1.05" diameter by means of its universal clamp and anti-rotation bracket. A crank arm and several mounting brackets are available for damper applications where the actuator cannot be direct coupled to the damper shaft. The spring return system provides minimum specified torque to the application during a power interruption. The EF..24-MFT actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.

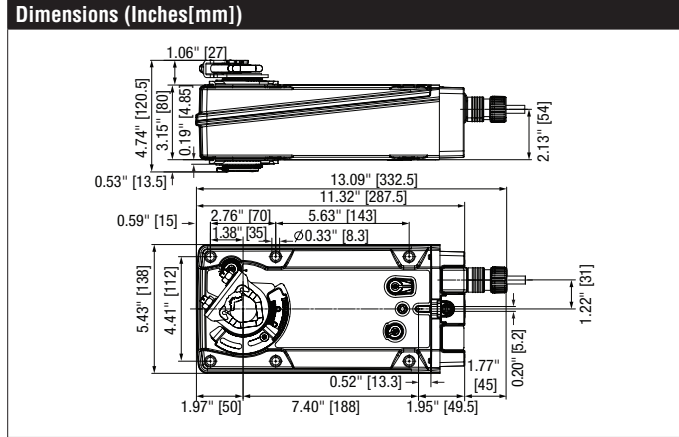
# EFB24-MFT - Damper Actuator

Modulating, Spring Return, 24 V, Multi-Function Technology®

Weight | 11.49 lb [5.21 kg]

\*Variable when configured with MFT options.

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3



# EFB24-MFT - Damper Actuator

## Modulating, Spring Return, 24 V, Multi-Function Technology®

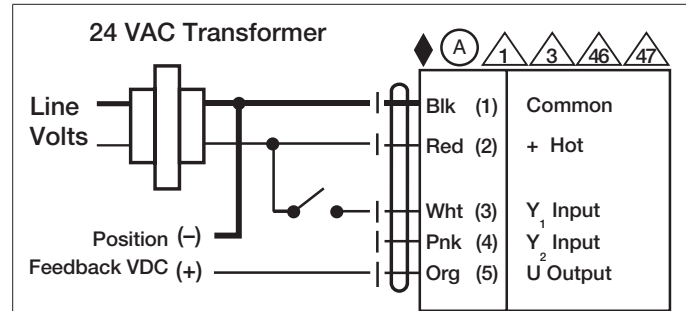


### Accessories

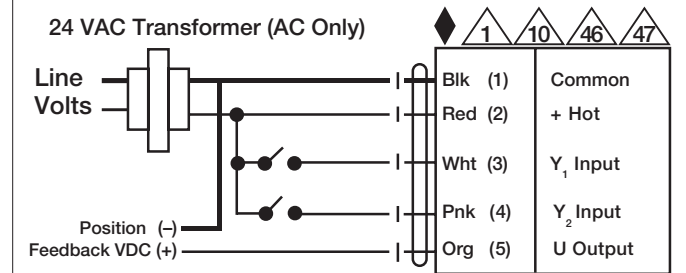
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
MFT-P	Belimo PC-Tool
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
TF-CC US	Cable conduit connector, 1/2".
UK24BAC	Gateway MP to BACnet MS/TP
UK24LON	Gateway MP to LonWorks
UK24MOD	Gateway MP to Modbus RTU
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.
ZK1-GEN	Connection cable 5 m
ZK2-GEN	Connection cable 5 m
ZTH US	Handheld programming tool w/ ZK1-GEN, ZK2-GEN, ZK6-GEN.

### Typical Specification

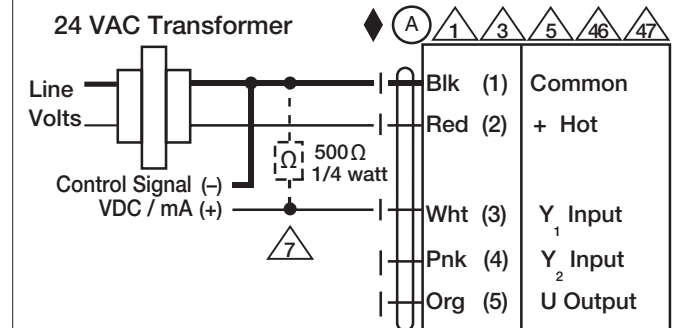
Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback or master slave applications. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.



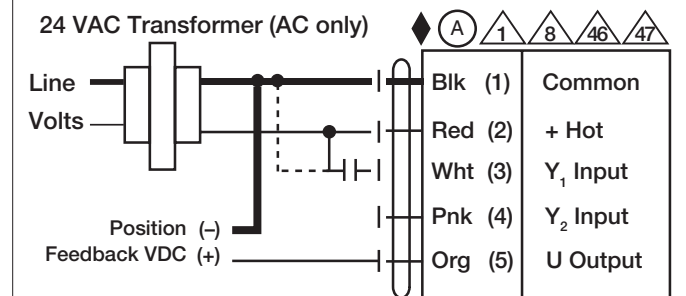
### On/Off



### Floating Point



### VDC/mA Control



### PWM Control

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## Wiring Diagrams

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◆ Meets cULus requirements without the need of an electrical ground connection.

Ⓐ Actuators with appliance cables are numbered.

1 Provide overload protection and disconnect as required.

3 Actuators may also be powered by 24 VDC.

5 Only connect common to negative (-) leg of control circuits.

7 A 500 Ω resistor (ZG-R01) converts the 4 to 20 mA control signal to 10 VDC.

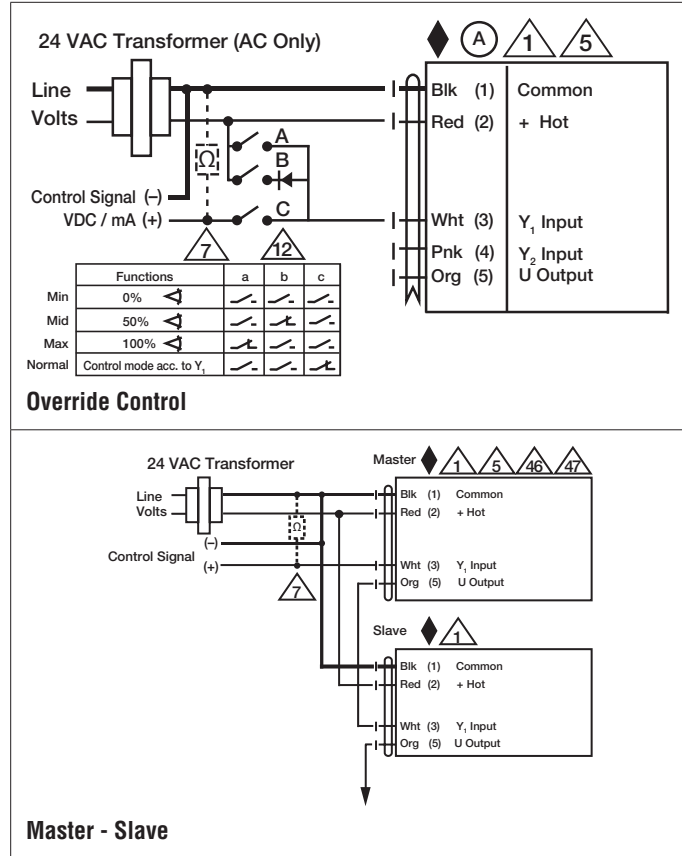
8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.

10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.

12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).

46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.

47 Master-Slave wiring required for piggy-back applications. Feedback from Master to control input(s) of Slave(s).



# EFB24-MFT-S - Damper Actuator

Modulating, Spring Return, 24 V, Multi-Function Technology®



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	(2) 3ft [1m], 18 GA appliance cables with 1/2" conduit connectors
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V (default), 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor), variable (VDC, PWM, floating point, on/off)
Operating range Y variable	starting point DC 0.5...30 V end point DC 2.5...32 V
Input Impedance	100 kΩ for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for PWM, floating point and On/Off
Position Feedback	DC 2...10 V, Max. 0.5 mA, VDC variable
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	default 150 sec, variable 60...150 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Angle Of Rotation Adaption	off (default)
override control	min. position = 0% , mid. Position = 50% , max. position = 100% (Default)
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤45.3 dB (A) @ 150 sec, run time dependent
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.88 lb [5.39 kg]

**Torque min. 270 in-lb, for control of air dampers, Control 2 to 10 VDC (Default), Feedback 2 to 10 VDC (Default)**

## Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. A feedback signal is provided for position indication or master-slave applications. Two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft. OR Maximum of three EF's can be piggybacked for torque loads of up to 810 in-lbs. Minimum 1" diameter shaft. Master-Slave wiring for either configuration.

## Default/Configuration

Default parameters for 2 to 10 VDC applications of the EF.-MFT actuator are assigned during manufacturing. If required, custom versions of the actuator can be ordered. The parameters are variable and can be changed by three means: Factory pre-set or custom configuration, set by the customer using PC-Tool software or the handheld ZTH US.

## Operation

The EF..24-MFT actuator provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper mechanical stop and use this point for its zero position during normal control operations. A unique manual override allows the setting of any actuator position within its 95° of rotation with no power applied. This mechanism can be released physically by the use of a crank supplied with the actuator. When power is applied the manual override is released and the actuator drives toward the fail-safe position. The actuator uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls the brushless DC motor's rotation and provides a Digital Rotation Sensing (DRS) function to prevent damage to the actuator in a stall condition. The position feedback signal is generated without the need for mechanical feedback potentiometers using DRS. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-MFT is mounted directly to control shafts up to 1.05" diameter by means of its universal clamp and anti-rotation bracket. A crank arm and several mounting brackets are available for damper applications where the actuator cannot be direct coupled to the damper shaft. The spring return system provides minimum specified torque to the application during a power interruption. The EF..24-MFT actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

**Installation Note:** Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.

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800-543-9038 USA

866-805-7089 CANADA

203-791-8396 LATIN AMERICA / CARIBBEAN

\*Variable when configured with MFT options.

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.

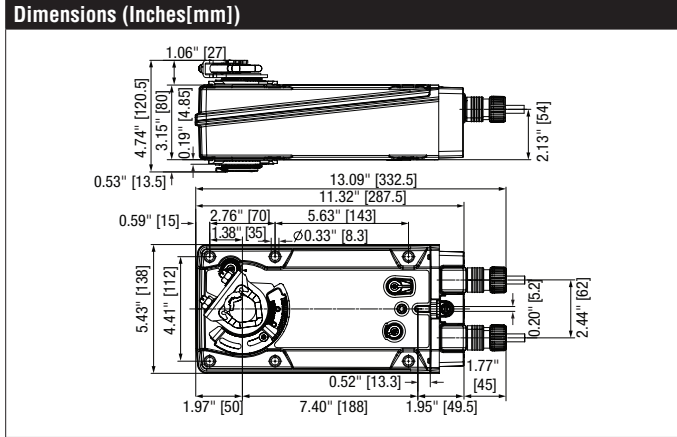
# EFB24-MFT-S - Damper Actuator

Modulating, Spring Return, 24 V, Multi-Function Technology®

Quality Standard	ISO 9001
Weight	11.88 lb [5.39 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 10° to 90°

\*Variable when configured with MFT options.

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.





# EFB24-MFT-S - Damper Actuator

## Modulating, Spring Return, 24 V, Multi-Function Technology®

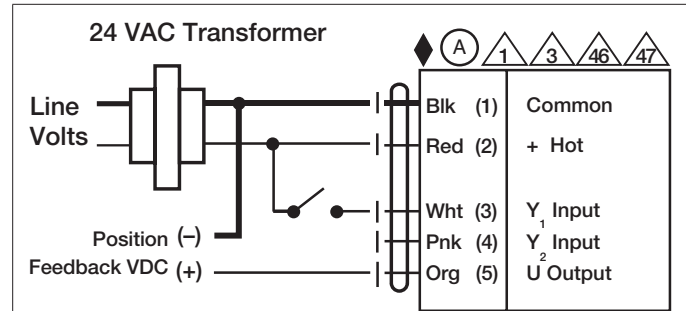


### Accessories

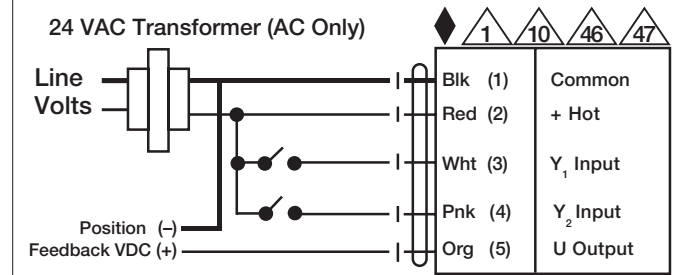
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
MFT-P	Belimo PC-Tool
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
TF-CC US	Cable conduit connector, 1/2".
UK24BAC	Gateway MP to BACnet MS/TP
UK24LON	Gateway MP to LonWorks
UK24MOD	Gateway MP to Modbus RTU
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.
ZK1-GEN	Connection cable 5 m
ZK2-GEN	Connection cable 5 m
ZTH US	Handheld programming tool w/ ZK1-GEN, ZK2-GEN, ZK6-GEN.

### Typical Specification

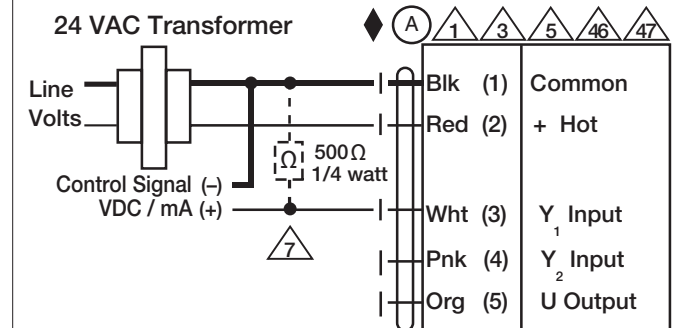
Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback or master slave applications. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.



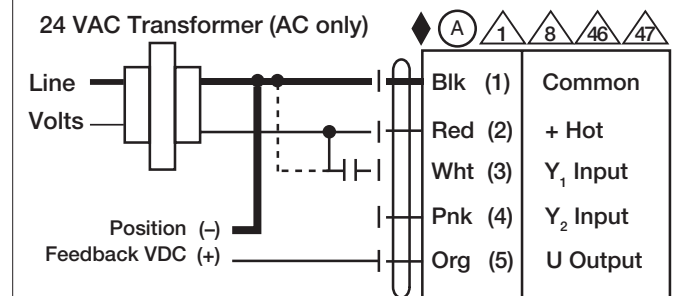
On/Off



Floating Point



VDC/mA Control



PWM Control

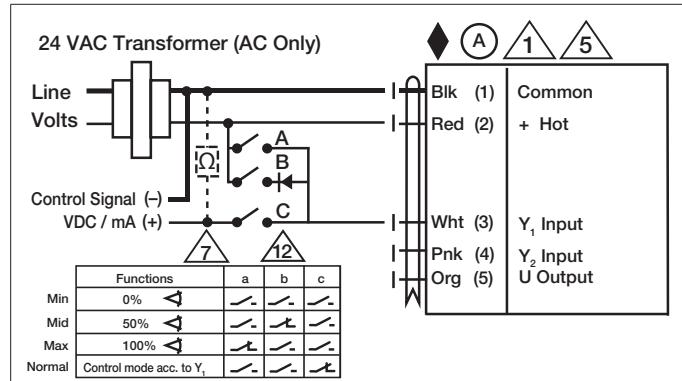
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## Wiring Diagrams

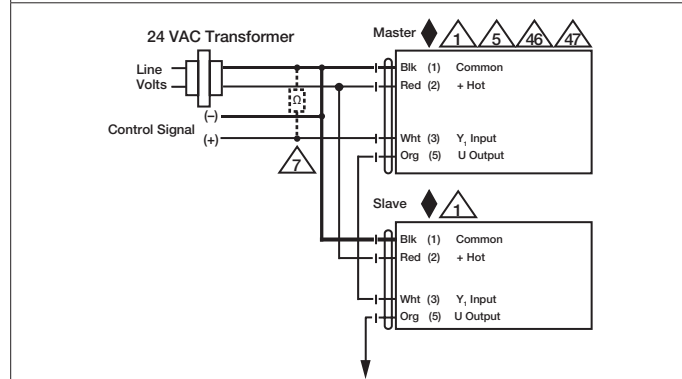
**⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.

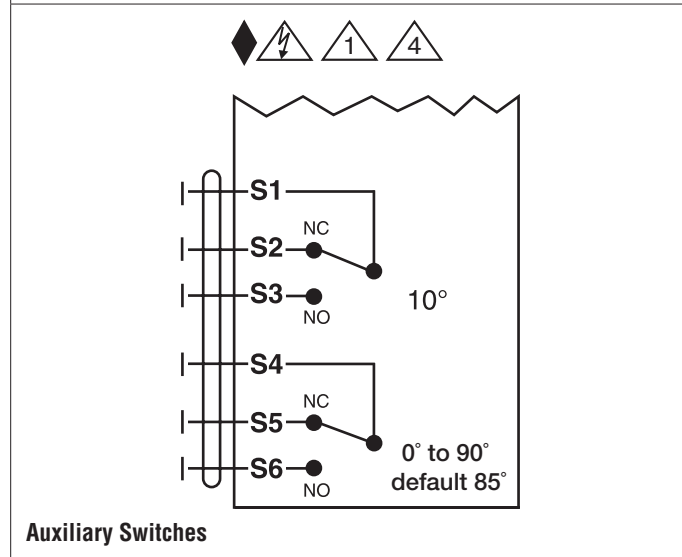
- Ⓐ Actuators with appliance cables are numbered.
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 5 Only connect common to negative (-) leg of control circuits.
- 7 A 500 Ω resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.
- 8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.
- 12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).
- 46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.
- 47 Master-Slave wiring required for piggy-back applications. Feedback from Master to control input(s) of Slave(s).



## Override Control



## Master - Slave



## Auxiliary Switches

# EFB24-MFT-S N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, Multi-Function Technology®



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V (default), 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor), variable (VDC, PWM, floating point, on/off)
Operating range Y variable	starting point DC 0.5...30 V end point DC 2.5...32 V
Input Impedance	100 kΩ for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA, 1500 Ω for PWM, floating point and On/Off
Position Feedback	DC 2...10 V, Max. 0.5 mA, VDC variable
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	default 150 sec, variable 60...150 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Angle Of Rotation Adaption	off (default)
override control	min. position = 0% , mid. Position = 50% , max. position = 100% (Default)
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤45.3 dB (A) @ 150 sec, run time dependent
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1.02 kg

**Torque min. 270 in-lb, for control of air dampers, Control 2 to 10 VDC (Default), Feedback 2 to 10 VDC (Default)**

## Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. A feedback signal is provided for position indication or master-slave applications. Two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft. OR Maximum of three EF's can be piggybacked for torque loads of up to 810 in-lbs. Minimum 1" diameter shaft. Master-Slave wiring for either configuration.

## Default/Configuration

Default parameters for 2 to 10 VDC applications of the EF.-MFT actuator are assigned during manufacturing. If required, custom versions of the actuator can be ordered. The parameters are variable and can be changed by three means: Factory pre-set or custom configuration, set by the customer using PC-Tool software or the handheld ZTH US.

## Operation

The EF..24-MFT N4 actuator provides 95° of rotation and comes with a graduated position indicator showing 0° to 95°. The actuator will synchronize the 0° mechanical stop or the physical damper mechanical stop and use this as its zero position during normal control operations. A unique manual override allows the setting of any actuator position within its 95° of rotation with no power applied. This mechanism can be released physically by the use of a crank supplied with the actuator. When power is applied the manual override is released and the actuator drives toward the fail-safe position. The actuator uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor controls the ASIC to provide a constant rotation rate and to know the actuator's exact position. The ASIC monitors and controls the brushless DC motor's rotation and provides a Digital Rotation Sensing (DRS) function to prevent damage to the actuator in a stall condition. The position feedback signal is generated without the need for mechanical feedback potentiometers using DRS. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-MFT N4 is mounted directly to control shafts up to 1.05" diameter with its universal clamp and anti-rotation bracket. A crank arm and several mounting brackets are available for damper applications where the actuator cannot be direct coupled to the damper shaft. The spring return system provides minimum specified torque to the application during a power interruption. The EF..24-MFT N4 actuator is shipped at 5° (5° from full failsafe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper conductor, wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6, 6X or watertight.

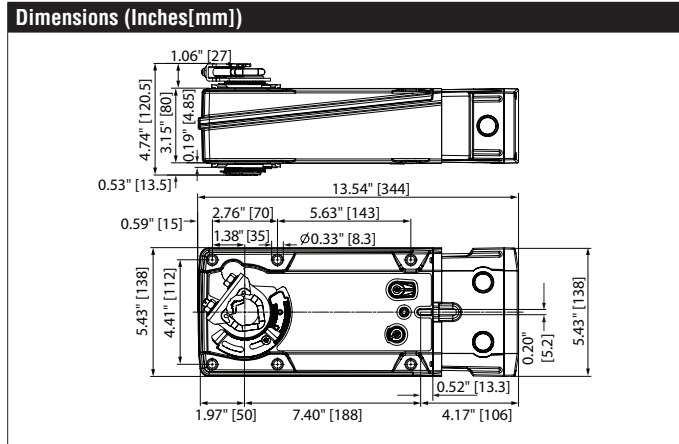
# EFB24-MFT-S N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, Multi-Function Technology®

Quality Standard	ISO 9001
Weight	1.02 kg
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one set at 85°

\*Variable when configured with MFT options.

†Rated Impulse Voltage 800V, Type of action 1.AA.B, Control Pollution Degree 4.



# EFB24-MFT-S N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, Multi-Function Technology®

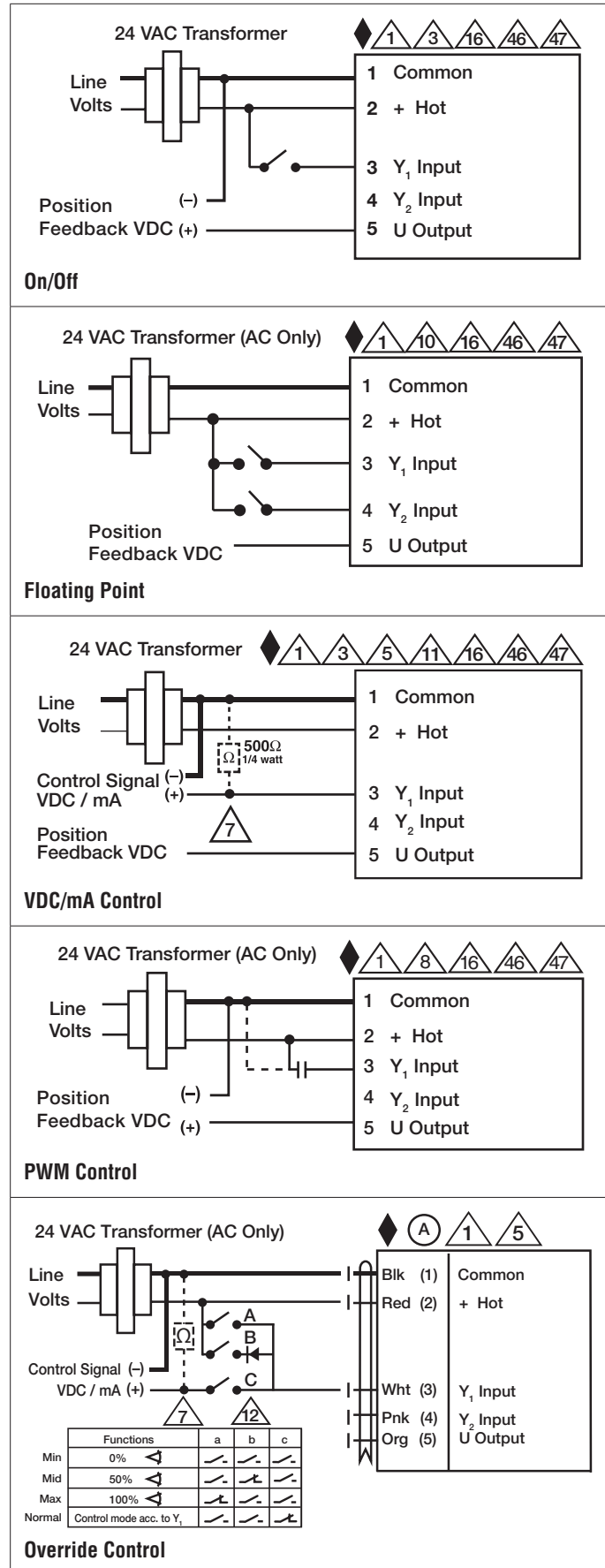


## Accessories

AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
MFT-P	Belimo PC-Tool
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
UK24BAC	Gateway MP to BACnet MS/TP
UK24LON	Gateway MP to LonWorks
UK24MOD	Gateway MP to Modbus RTU
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.
ZK1-GEN	Connection cable 5 m
ZK2-GEN	Connection cable 5 m
ZTH US	Handheld programming tool w/ ZK1-GEN, ZK2-GEN, ZK6-GEN.

## Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback or master slave applications. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.



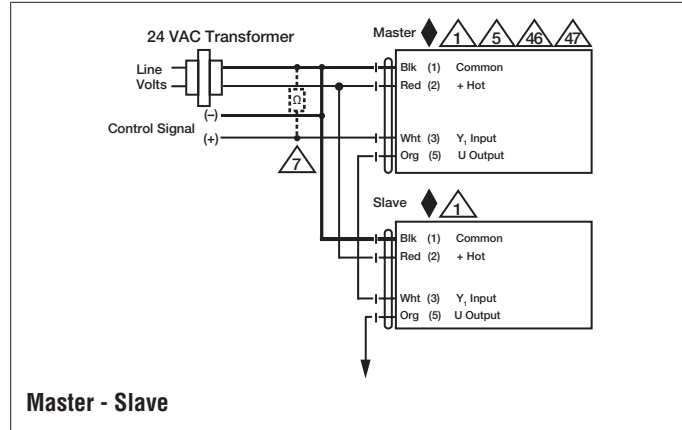
Date created, 02/04/2019 - Subject to change. © Belimo Aircontrols (USA), Inc.

## Wiring Diagrams

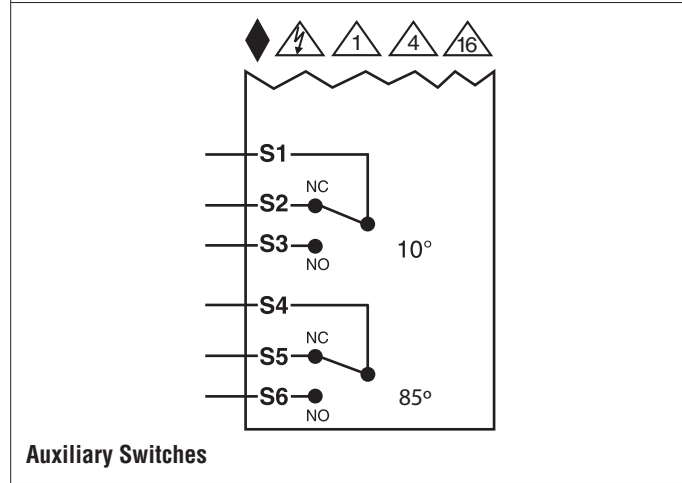
**⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

- ◆ Meets cULus requirements without the need of an electrical ground connection.
- ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.

- Ⓐ Actuators with appliance cables are numbered.
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 5 Only connect common to negative (-) leg of control circuits.
- 7 A 500 Ω resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.
- 8 Control signal may be pulsed from either the Hot (Source) or Common (Sink) 24 VAC line.
- 10 For triac sink the Common connection from the actuator must be connected to the Hot connection of the controller. Position feedback cannot be used with a triac sink controller; the actuator internal common reference is not compatible.
- 12 IN4004 or IN4007 diode. (IN4007 supplied, Belimo part number 40155).
- 16 Actuators are provided with a numbered screw terminal strip instead of a cable.
- 46 Actuators may be controlled in parallel. Current draw and input impedance must be observed.
- 47 Master-Slave wiring required for piggy-back applications. Feedback from Master to control input(s) of Slave(s).



Master - Slave



Auxiliary Switches

# EFB24-S - Damper Actuator

On/Off, Spring Return, 24 VAC/DC



## Technical Data

Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	(2) 3ft [1m], 18 GA appliance cables with 1/2" conduit connectors
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1278.9000000000001 lb [5.28 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 10° to 90°

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.

**Torque min. 270 in-lb, for control of air dampers**

### Application

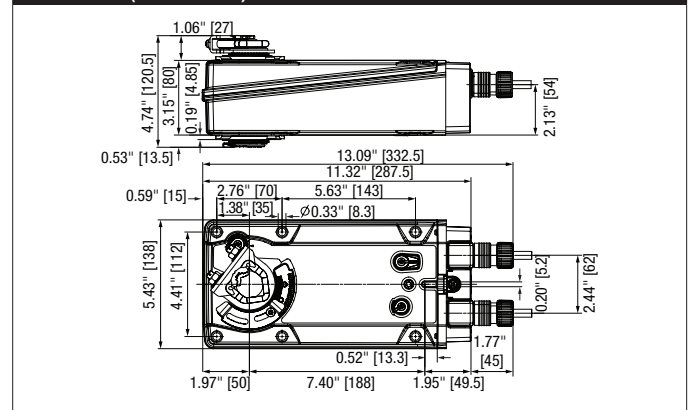
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

### Operation

The EF..24-S series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF..24-S series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-S versions are provided with two built-in auxiliary switches. These SPDT switches are provided for safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is adjustable between 10° to +85°. The EF..24-S actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

**Installation Note:** Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.

### Dimensions (Inches[mm])



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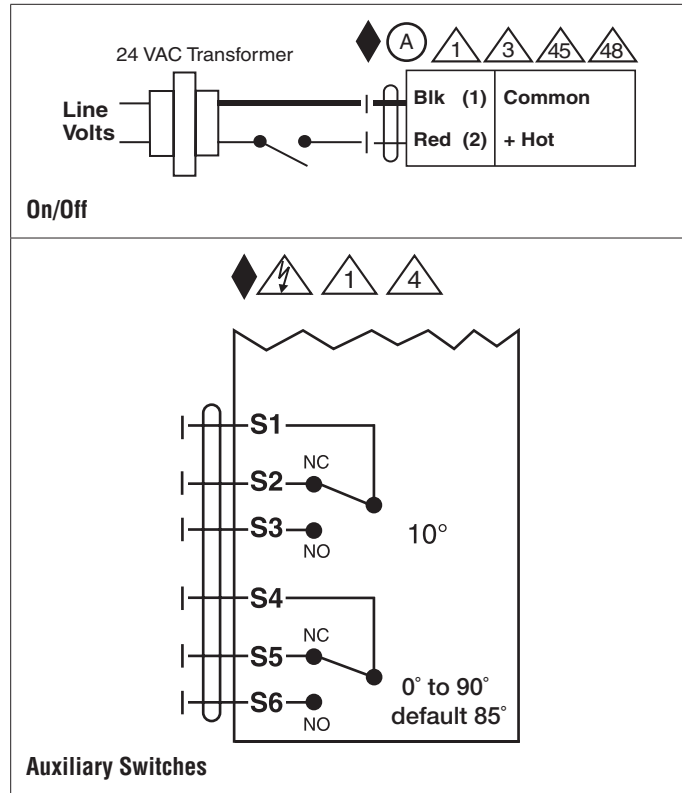
Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
TF-CC US	Cable conduit connector, 1/2".
ZG-X40	120 to 24 VAC, 40 VA transformer.

### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided having the capability of one being adjustable. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

- ⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
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- ◆ Meets cULus requirements without the need of an electrical ground connection.
  - ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
  - Ⓐ Actuators with appliance cables are numbered.
  - 1 Provide overload protection and disconnect as required.
  - 3 Actuators may also be powered by 24 VDC.
  - 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
  - 45 Actuators may be powered in parallel. Power consumption must be observed.
  - 48 Parallel wiring required for piggy-back applications.





# EFB24-S N4 - Damper Actuator

## NEMA 4, On/Off, Spring Return, 24 V



### Technical Data

Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1.02 kg
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one set at 85°

†Rated Impulse Voltage 800V, Type of action 1.AA.B, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

### Application

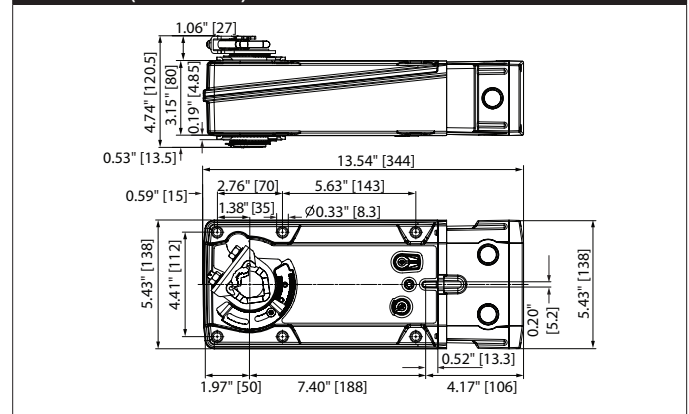
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 3/4" diameter shaft and parallel wiring.

### Operation

The EF..24-S N4 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF..24-S N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-S N4 versions are provided with two built-in auxiliary switches. These SPDT switches are provided for safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is fixed at 85°. The EF..24-S N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.

### Dimensions (Inches[mm])



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Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
ZG-X40	120 to 24 VAC, 40 VA transformer.

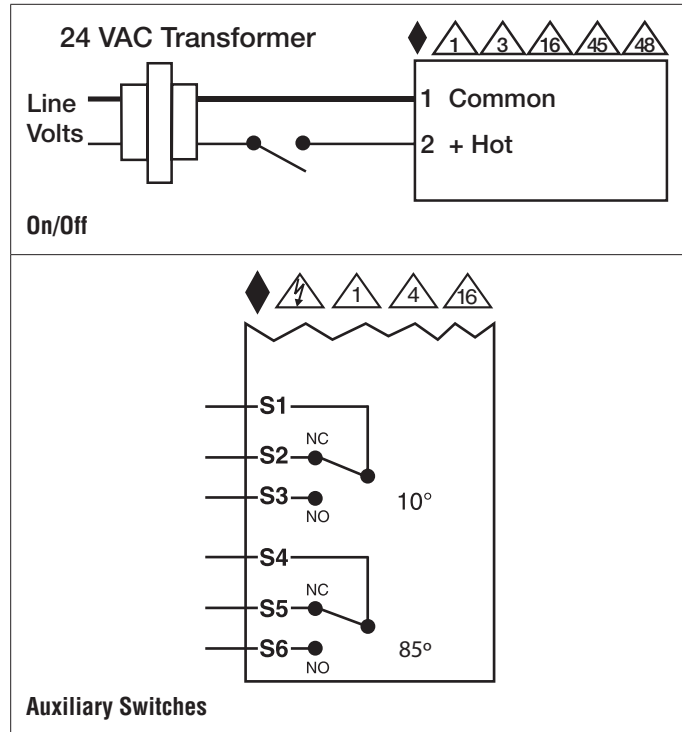
### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

**⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
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- ◆ Meets cULus requirements without the need of an electrical ground connection.
- ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
- 1 Provide overload protection and disconnect as required.
- 3 Actuators may also be powered by 24 VDC.
- 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
- 16 Actuators are provided with a numbered screw terminal strip instead of a cable.
- 45 Actuators may be powered in parallel. Power consumption must be observed.
- 48 Parallel wiring required for piggy-back applications.



# EFB24-SR - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4...20 mA Control Signal



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	8 W
Power consumption in rest position	4.5 W
Transformer sizing	14 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	3 ft [1 m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for 2...10 VDC (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	DC 2...10 V, Max. 0.5 mA
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lb [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	95 sec
Running time emergency control position	<20 sec @ -4...122°F [-20...50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.31 lb [5.13 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

## Torque min. 270 in-lb, for control of air dampers

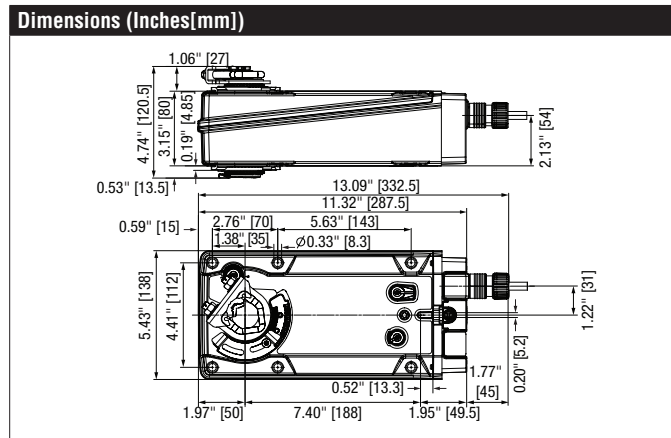
### Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

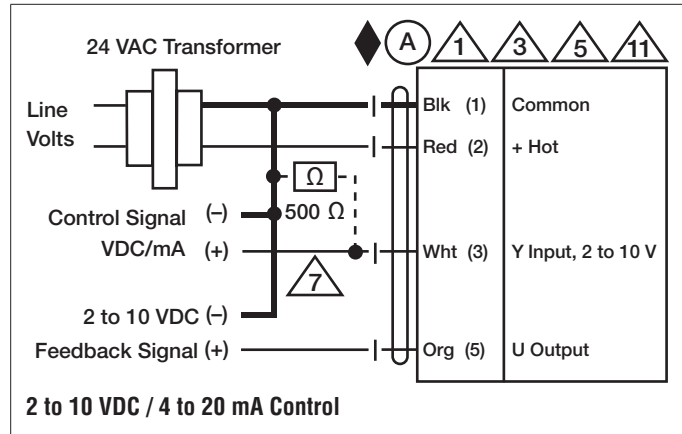
### Operation

The EF.24-SR series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.24-SR series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The EF.24-SR uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.24-SR actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.



Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
TF-CC US	Cable conduit connector, 1/2".
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.



### Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

# EFB24-SR - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4...20 mA Control Signal

## Wiring Diagrams



### **WARNING! LIVE ELECTRICAL COMPONENTS!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Meets cULus requirements without the need of an electrical ground connection.



Actuators with appliance cables are numbered.



Provide overload protection and disconnect as required.



Actuators may also be powered by 24 VDC.



Only connect common to negative (-) leg of control circuits.



A 500  $\Omega$  resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.



Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.

# EFB24-SR N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, for 2 or 10 VDC or 4...20 mA Control Signal



## Technical Data

Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	8 W
Power consumption in rest position	4.5 W
Transformer sizing	14 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for 2...10 VDC (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	DC 2...10 V, Max. 0.5 mA
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lb [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	95 sec
Running time emergency control position	<20 sec @ -4...122°F [-20...50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	6.28 lb [5.3 kg]

†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

## Application

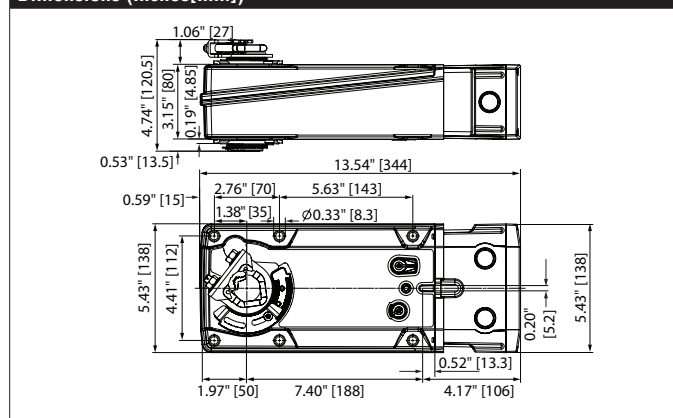
For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

## Operation

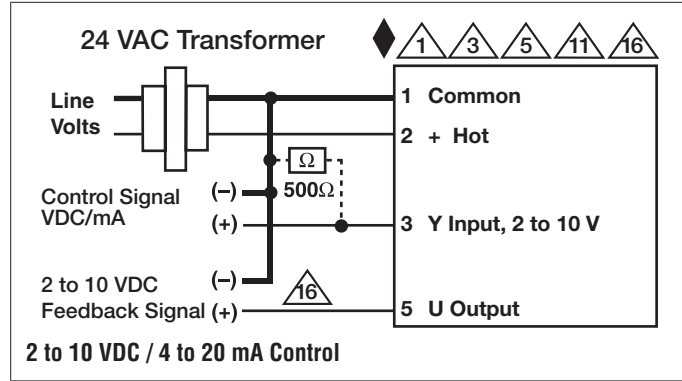
The EF.24-SR N4 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.24-SR N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The EF.24-SR N4 uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.24-SR N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.

## Dimensions (Inches[mm])



Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.



### Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

# EFB24-SR N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, for 2 or 10 VDC or 4...20 mA Control Signal

## Wiring Diagrams



### **WARNING! LIVE ELECTRICAL COMPONENTS!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Meets cULus requirements without the need of an electrical ground connection.



Provide overload protection and disconnect as required.



Actuators may also be powered by 24 VDC.



Only connect common to negative (-) leg of control circuits.



Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.



Actuators are provided with a numbered screw terminal strip instead of a cable.



# EFB24-SR-S - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4...20 mA Control Signal



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	8 W
Power consumption in rest position	4.5 W
Transformer sizing	14 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	(2) 3 ft [1 m], 18 GA appliance cables with 1/2" conduit connectors
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V, 4...20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for 2...10 VDC (0.1 mA), 500 Ω for 4...20 mA
Position Feedback	DC 2...10 V, Max. 0.5 mA
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lb [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	95 sec
Running time emergency control position	<20 sec @ -4...122°F [-20...50°C], <60 sec @ -22°F [-30°C]
Angle Of Rotation Adaption	manual, by double clicking cw/ccw switch
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122°F [-30...50°C]
Non-operating temperature	-40...176°F [-40...80°C]
Degree of Protection	IP54, NEMA 2, UL Enclosure Type 2
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	11.46 lb [5.2 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one adjustable 10° to 90°

†Rated Impulse Voltage 800V, Type of Action 1.AA.B, Control Pollution Degree 3.

**Torque min. 270 in-lb, for control of air dampers**

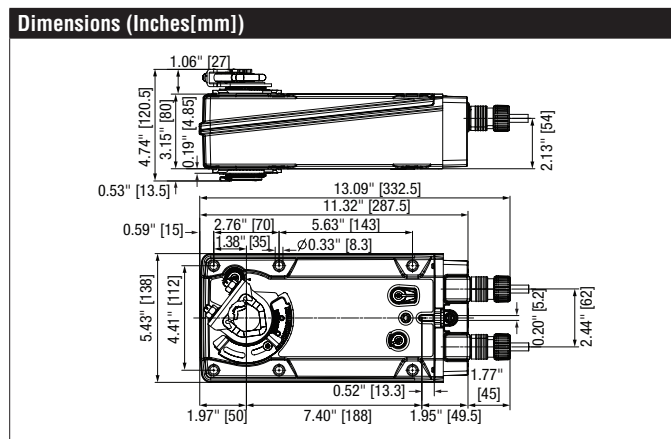
## Application

For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

## Operation

The EF..24-SR-S series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. EF..24-SR-S actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off. The EF..24-SR-S series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The EF..24-SR-S uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-SR-S versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is adjustable between 10° to +85°.

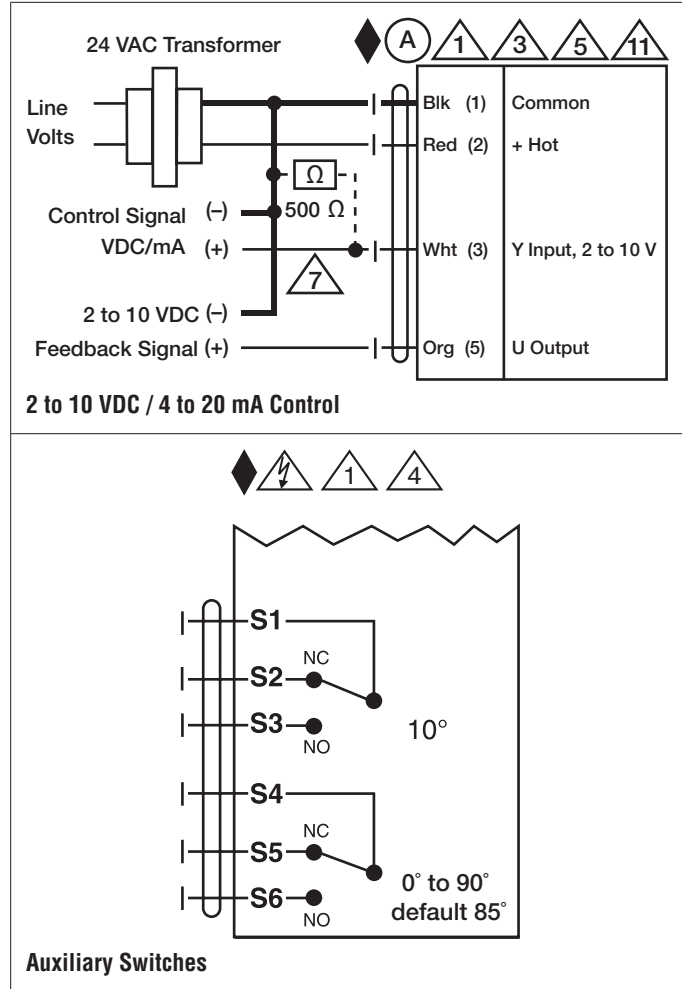
**Installation Note:** Use flexible metal conduit. Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure. Screw in conduit connector. Jacket the actuator's input wiring with UL listed flexible conduit. Properly terminate the conduit in a suitable junction box.



Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
TF-CC US	Cable conduit connector, 1/2".
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.

### Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.



# EFB24-SR-S - Damper Actuator

Modulating, Spring Return, 24 VAC/DC, for 2 to 10 VDC or 4...20 mA Control Signal

## Wiring Diagrams



### **WARNING! LIVE ELECTRICAL COMPONENTS!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Meets cULus requirements without the need of an electrical ground connection.



Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.



Actuators with appliance cables are numbered.



Provide overload protection and disconnect as required.



Actuators may be connected in parallel. Power consumption and input impedance must be observed.



Actuators may also be powered by 24 VDC.



Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.



Only connect common to negative (-) leg of control circuits.



A 500  $\Omega$  resistor (ZG-R01) converts the 4 to 20 mA control signal to 2 to 10 VDC.



Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.

# EFB24-SR-S N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, for 2 or 10 VDC or 4 to 20 mA Control Signal



## Technical Data

Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	8 W
Power consumption in rest position	4.5 W
Transformer sizing	14 VA (class 2 power source)
Shaft Diameter	1/2" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Operating Range	DC 2...10 V, 4 to 20 mA w/ ZG-R01 (500 Ω, 1/4 W resistor)
Input Impedance	100 kΩ for 2 to 10 VDC (0.1 mA), 500 Ω for 4 to 20 mA
Position Feedback	DC 2...10 V, Max. 0.5 mA
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with built-in switch
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	95 sec
Running time emergency control position	<20 sec @ -4°F to 122°F [-20°C to 50°C], <60 sec @ -22°F [-30°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤71 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	1.02 kg
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one set at 85°

†Rated Impulse Voltage 800V, Type of action 1.AA.B, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

## Application

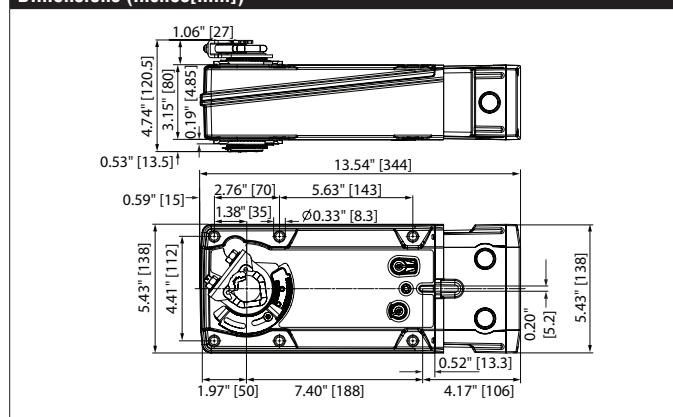
For fail-safe, modulating control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The actuator operates in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication. Not to be used for a master-slave application.

## Operation

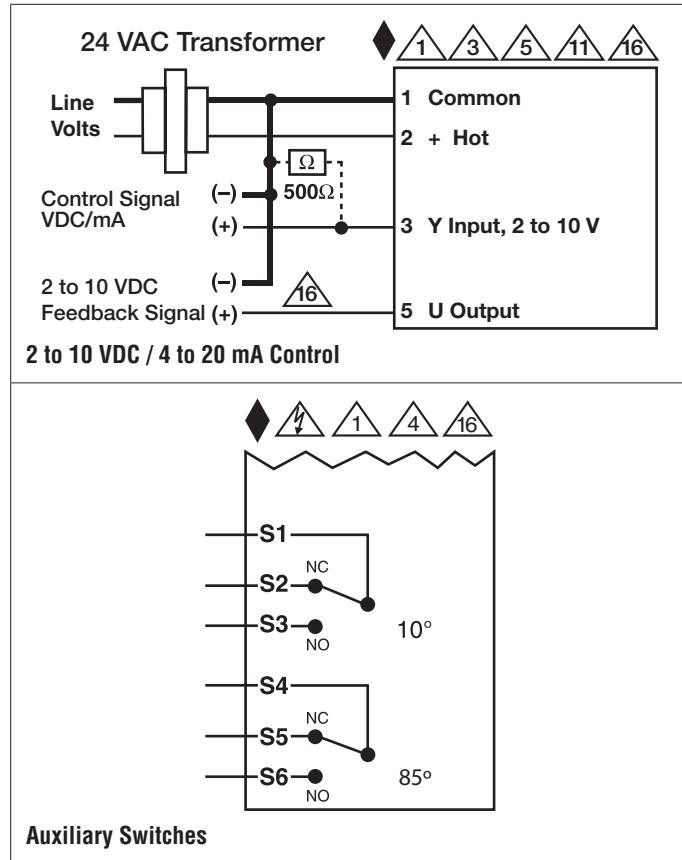
The EF.24-SR-S N4 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.24-SR-S N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The EF.24-SR-S N4 uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.24-SR-S N4 versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is fixed at 85°. The EF.24-SR-S N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.

## Dimensions (Inches[mm])



Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
ADS-100	Analog to digital switch for modulating actuators.
IRM-100	Input rescaling module for modulating actuators.
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
PTA-250	Pulse width modulation interface for modulating actuators.
SGA24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
SGF24	Positioners suitable for use with the modulating damper actuators LM..A-SR, NM..A-SR, SM..A-SR and GM..A-SR
ZG-R01	4 to 20 mA adaptor, 500Ω, 1/4 W resistor w 6" pigtail wires.
ZG-R02	50% voltage divider kit (resistors with wires).
ZG-SGF	Mounting plate for SGF.
ZG-X40	120 to 24 VAC, 40 VA transformer.



### Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide modulating damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

# EFB24-SR-S N4 - Damper Actuator

NEMA 4, Modulating, Spring Return, 24 V, for 2 or 10 VDC or 4 to 20 mA Control Signal

## Wiring Diagrams



### **WARNING! LIVE ELECTRICAL COMPONENTS!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



Meets cULus requirements without the need of an electrical ground connection.



Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.



Provide overload protection and disconnect as required.



Actuators may also be powered by 24 VDC.



Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.



Only connect common to negative (-) leg of control circuits.



Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.



Actuators are provided with a numbered screw terminal strip instead of a cable.

# EFCX120-S N4 - Damper Actuator

NEMA 4, On/Off, Spring Return, 100 to 240 VAC, 10 Second Fail-Safe



## Technical Data

Power Supply	100...240 VAC, -20% / +10%, 50/60 Hz, 100...125 VDC, ±10%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	21 VA @ 100 VAC, 29 VA @ 240 VAC
Shaft Diameter	3/4" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	10 sec @ -4°F to 122°F [-20°C to 50°C], <15 sec @ -22°F to -4°F [-30°C to -20°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤72 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	10.87 lb [4.93 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one set at 85°

†Rated Impulse Voltage 4kV, Type of action 1.A.A.B, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

## Application

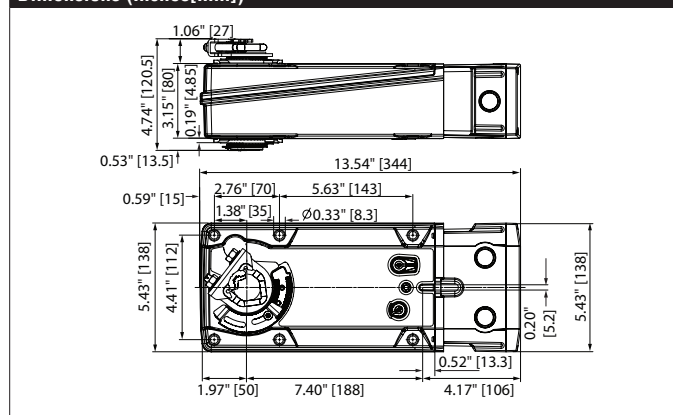
For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 1" diameter shaft and parallel wiring.

## Operation

The EF.120-S N4 series actuators provide true spring return operation for reliable fail-safe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF.120-S N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF.120-S N4 versions are provided with two built-in auxiliary switches. These SPDT switches provide safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is fixed at 85°. The EF.120-S N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.

## Dimensions (Inches[mm])



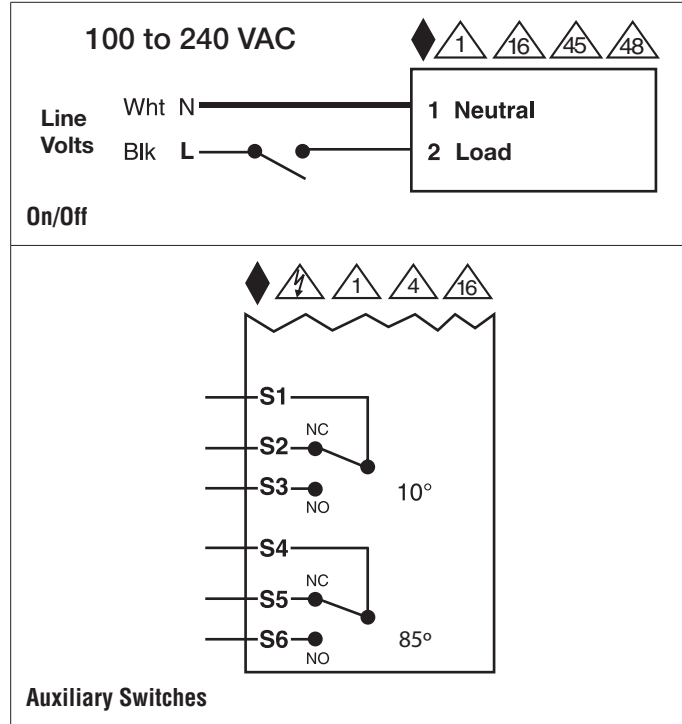
Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
ZG-DC2	Damper clip for damper blade, 6" width.
ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.

### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

### Wiring Diagrams

- ⚠ WARNING! LIVE ELECTRICAL COMPONENTS!**  
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
- ◆ Meets cULus requirements without the need of an electrical ground connection.
  - ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
  - 1 Provide overload protection and disconnect as required.
  - 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
  - 16 Actuators are provided with a numbered screw terminal strip instead of a cable.
  - 45 Actuators may be powered in parallel. Power consumption must be observed.
  - 48 Parallel wiring required for piggy-back applications.





# EFCX24-S N4 - Damper Actuator

## NEMA 4, On/Off, Spring Return, 24 V, 10 Second Fail-Safe



Technical Data	
Power Supply	24 VAC, ±20%, 50/60 Hz, 24 VDC, -10% / +20%
Power consumption in operation	9.5 W
Power consumption in rest position	4.5 W
Transformer sizing	16 VA (class 2 power source)
Shaft Diameter	3/4" to 1.05" round, centers on 3/4" with insert, 1.05" without insert
Electrical Connection	terminal block(s) inside junction box with knockouts
Overload Protection	electronic throughout 0° to 95° rotation
Electrical Protection	actuators are double insulated
Angle of rotation	Max. 95°, adjustable with mechanical end stop, 35° to 95°
Torque motor	270 in-lbs [30 Nm]
direction of rotation motor	reversible with CW/CCW mounting
direction of rotation spring-return	reversible with CW/CCW mounting
Position indication	visual indicator, 0° to 95° (0° is full spring return position)
Manual override	5 mm hex crank (3/16" Allen), supplied
Running time motor	75 sec
Running time emergency control position	10 sec @ -4°F to 122°F [-20°C to 50°C], <15 sec @ -22°F to -4°F [-30°C to -20°C]
Ambient humidity	5 to 95% RH non-condensing
Ambient temperature	-22...122 °F [-30...50 °C]
Non-operating temperature	-40...176 °F [-40...80 °C]
Degree of Protection	IP66, NEMA 4, UL Enclosure Type 4
Housing material	Aluminum die cast and plastic casing
Agency Listing	cULus acc. to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE acc. to 2004/108/EC and 2006/95/EC
Noise level, motor	≤56.5 dB (A)
Noise Level (Fail-Safe)	≤72 dB (A)
Maintenance	maintenance free
Quality Standard	ISO 9001
Weight	10.83 lb [4.91 kg]
Auxiliary switch	2 x SPDT, 3A resistive (0.5A inductive) @ 250 VAC, one set at 10°, one set at 85°

†Rated Impulse Voltage 800V, Type of action 1.AA.B, Control Pollution Degree 4.

**Torque min. 270 in-lb, for control of air dampers**

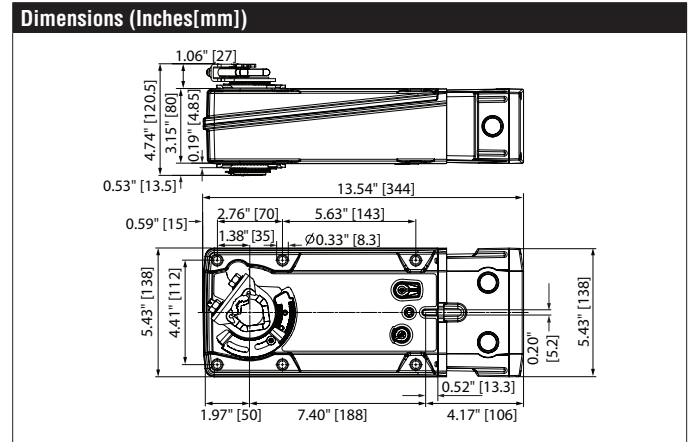
### Application

For On/Off, fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Control is On/Off from an auxiliary contact or a manual switch. The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. Maximum of two EF's can be piggybacked for torque loads of up to 540 in-lbs. Minimum 1" diameter shaft and parallel wiring.

### Operation

The EF..24-S N4 series actuators provide true spring return operation for reliable failsafe application and positive close off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The EF..24-S N4 series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. The EF..24-S N4 versions are provided with two built-in auxiliary switches. These SPDT switches are provided for safety interfacing or signaling, for example, for fan start-up. The switching function at the fail-safe position is fixed at 10°, the other switch function is fixed at 85°. The EF..24-S N4 actuator is shipped at 5° (5° from full fail-safe) to provide automatic compression against damper gaskets for tight shut-off.

Installation Note: Use 60°C/75°C copper (CU) conductor and wire size range 12-26 AWG, stranded or solid. If conduit is used, use flexible metal conduit; UL listed and CSA certified strain relief or conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.



Date created, 02/04/2019 - Subject to change. © Belimo Aircontrols (USA), Inc.

Accessories	
AV8-25	Shaft extension 240 mm [9.8"]
EF-P	Anti-rotation bracket EFB(X)/GKB(X)/GMB(X).
IND-EFB	Stop indicator
K9-2	Spindle clamp set
KG10A	Straight ball joint with M8
KH10	Damper lever
KH-EFB	Actuator arm
SH10	Push rod for KG10A ball joint (36" L, 3/8" diameter).
TOOL-07	13 mm wrench.
ZG-100	Univ. right angle bracket (17" H x 11-1/8" W x 6" base).
ZG-120	Jackshaft mounting bracket.
ZG-DC1	Damper clip for damper blade, 3.5" width.
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ZG-EFB	Mounting kit for linkage operation EF.A
ZG-JSA-3	1.05" diameter jackshaft adaptor (12" L).
P475	Shaft mount, non-Mercury aux. switch for 1/2" dia. shafts.
P475-1	Shaft mount, non-Mercury aux. switch for 1" dia. shafts.
PS-100	Actuator power supply and control simulator.
ZG-X40	120 to 24 VAC, 40 VA transformer.

### Typical Specification

On/Off spring return damper actuators shall be direct coupled type which require no crank arm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuators must be designed so that they may be used for either clockwise or counter clockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, two SPDT auxiliary switch shall be provided. Actuators with auxiliary switches must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be cULus listed and have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

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  - ⚡ Apply only AC line voltage or only UL-Class 2 voltage to the terminals of auxiliary switches. Mixed or combined operation of line voltage/safety extra low voltage is not allowed.
  - 1 Provide overload protection and disconnect as required.
  - 3 Actuators may also be powered by 24 VDC.
  - 4 Two built-in auxiliary switches (2x SPDT), for end position indication, interlock control, fan startup, etc.
  - 16 Actuators are provided with a numbered screw terminal strip instead of a cable.
  - 45 Actuators may be powered in parallel. Power consumption must be observed.
  - 48 Parallel wiring required for piggy-back applications.

